

## REMARKS

Claims 1, 3-17, 20-33, 35-49, and 52-64 are pending in the application.

Dependent claims 23-25 have each been amended for clarity to recite the proper antecedent term in dependent claim 22 from which these three claims depend. Claims 29-31 have each been amended for clarity to recite the proper antecedent term in dependent claim 28 from which these three claims depend. Claims 55-57 have each been amended for clarity to recite the proper antecedent term in dependent claim 54 from which these three claims depend. Claims 61-63 have each been amended for clarity to recite the proper antecedent term in dependent claim 62 from which these three claims depend.

Independent claims 1, 27, 33, and 59 have been amended for clarity to recite an acrylonitrile-styrene-acrylate (ASA) type resin. Said ASA resins represent a rubber modified thermoplastic resin comprising a discontinuous elastomeric phase dispersed in a rigid thermoplastic phase and are taught in paragraphs 0014-0016 (acrylate elastomeric phase) and in paragraph 0020 for example (rigid thermoplastic phase), and in examples of the specification.

Dependent claims 2 and 34 have been cancelled without disclaimer to the subject matter contained therein. The said subject matter of claims 2 and 34 has been incorporated into independent claims 1 and 33, respectively, which independent claims now recite an elastomeric phase comprising a polymer having structural units derived from at least one (C<sub>1</sub>-C<sub>12</sub>)alkyl(meth)acrylate monomer. Dependent claims 3-4 have been amended to change their claim dependency from the cancelled claim 2 to the independent claim 1. Dependent claims 35-36 have been amended to change their claim dependency from the cancelled claim 34 to the independent claims 33.

Dependent claims 18 and 19 have been cancelled without disclaimer to the subject matter contained therein. The said subject matter of claims 18 and 19 has been incorporated into independent claim 1, which now recites in step (b) a mixture of monomers comprising at least one vinyl aromatic monomer, at least one

monoethylenically unsaturated nitrile monomer, and at least one monomer selected from the group consisting of (C<sub>1</sub>-C<sub>12</sub>)alkyl- and aryl-(meth)acrylate monomers. Dependent claim 20 have been amended to change its claim dependency from the cancelled claim 19 to claim 17. Dependent claims 17 and 21 have been amended to reflect a mixture of monomers in independent claim 1.

Dependent claims 50 and 51 have been cancelled without disclaimer to the subject matter contained therein. The said subject matter of claims 50 and 51 has been incorporated into independent claim 33, which now recites in step (b) a mixture of monomers comprising at least one vinyl aromatic monomer, at least one monoethylenically unsaturated nitrile monomer, and at least one monomer selected from the group consisting of (C<sub>1</sub>-C<sub>12</sub>)alkyl- and aryl-(meth)acrylate monomers. Dependent claim 52 have been amended to change its claim dependency from the cancelled claim 51 to claim 49. Dependent claims 49 and 53 have been amended to reflect a mixture of monomers in independent claim 33.

The Applicant notes for the record that these claim amendments have been made to clarify the subject matter of the invention, and not in response to any rejection over the prior art. No new matter has been added to the claims under 35 U.S.C. §132 in making the claim amendments.

### **35 U.S.C. § 103(a) Rejections : Barghoorn**

The Examiner has rejected claims 1-64 under 35 U.S.C. 103(a) as being unpatentable over **Barghoorn** (U.S. 6,566,457). The Applicant courteously traverses these rejections with respect to the claims as amended.

The Examiner states the following (quote):

“The difference between the present claims and **Barghoorn** is the requirement in the present claims that step (b) is a polymerization of alkyl- or aryl-(meth)acrylate monomer in the presence of the elastomeric phase from (a) step. Reference does not disclose adding polymerizable alkyl methacrylate monomer for making outer

shell polymer. It would have been obvious to one of ordinary skill in the art to modify a process for producing graft rubber in **Barghoorn's** invention wherein a graft shell is prepared in two steps, such that first step includes polymerization of a mixture of styrene monomer and an acrylonitrile monomer in the presence of a dispersion of elastomeric polymer for producing a first core/shell copolymer, and continuously adding alkyl methacrylate monomer in the polymerization vessel in the presence of previously grafted shell for producing a second grafted shell, because reference discloses two steps in succession for making the graft shell, column 15, lines 31-36, and wherein the order of the particular subsequent alkyl-(meth)acrylate monomer in the last polymerization process is depending on the desired characteristics of the resulting impact modifier, and it involves only routine skill of the worker in the art."

The Applicant respectfully submits that the stated object of **Barghoorn** is to provide a process for the preparation of diene-based graft rubbers which are suitable as impact modifiers (**Barghoorn**, column 2, lines 13-16). More specifically, **Barghoorn** is directed to preparing an aqueous dispersion of at least one elastomeric polymer "built up from at least one conjugated diene" (**Barghoorn**, column 2, lines 24-26). In contrast, independent claims 1 and 33 of the instant invention recite a method and composition, respectively, directed to an acrylonitrile-styrene-acrylate (ASA) type resin. Said ASA resins are well-known in the art and comprise an acrylate as elastomeric phase or "graft rubber" as taught in paragraphs 0014-0016 of the instant specification. More particularly said ASA resin has an elastomeric phase or "graft rubber" comprising a polymer having structural units derived from at least one (C<sub>1</sub>-C<sub>12</sub>)alkyl(meth)acrylate monomer as recited in independent claims 1 and 33. Furthermore, independent claims 27 and 59 specifically recite that the elastomeric phase comprises structural units derived from butyl acrylate.

As the Examiner has noted, **Barghoorn**, column 15, lines 31-36, teaches that (quote): "The graft shell may be prepared...in one or more steps. For example, styrene and/or alpha-methylstyrene may first be polymerized alone, and then styrene and acrylonitrile polymerized, in two steps in succession." However, there are no examples in **Barghoorn** exemplifying such processes. There is no further teaching in **Barghoorn**

regarding (i) the specific monomers to be employed in any multistep grafting reaction, nor (ii) their order of addition, nor (iii) their ratios when more than one monomer is employed in any step, as required by claims of the instant invention. As the Examiner has further noted, there is absolutely no teaching in **Barghoorn** of polymerization of any monomer selected from the group consisting of (C<sub>1</sub>-C<sub>12</sub>)alkyl- and aryl-(meth)acrylate monomers in any step of any multistep grafting reaction. More particularly, there is no teaching in **Barghoorn** of any process or composition derived from any process which comprises the steps of:

(a) polymerizing a mixture of monomers in a first stage in the presence of the elastomeric phase, at least one of which monomers is selected from the group consisting of vinyl aromatic monomers and at least one of which monomers is selected from the group consisting of monoethylenically unsaturated nitrile monomers, followed by

(b) polymerizing a mixture of monomers in at least one subsequent stage in the presence of the elastomeric phase from (a), wherein the monomers comprise at least one vinyl aromatic monomer, at least one monoethylenically unsaturated nitrile monomer, and at least one monomer selected from the group consisting of (C<sub>1</sub>-C<sub>12</sub>)alkyl- and aryl-(meth)acrylate monomers,

as required by the claims of the instant invention.

Therefore, there is no guidance in **Barghoorn** for anyone skilled in the art for preparing any rubber modified thermoplastic resin comprising an acrylate rubber. More specifically, there is no guidance regarding (i) the specific monomers to be employed in each step of a grafting reaction, and (ii) the order of addition of said monomers, and (iii) the ratio of said monomers when more than one monomer is employed in any step, as required by claims of the instant invention.

The properties of rubber modified thermoplastic resins comprising an acrylate rubber as taught in the instant invention are quite different from those of such resins having non-polar diene-derived rubbers as impact modifiers as taught in **Barghoorn**.

There is no motivation for anyone skilled in the art to employ any teaching in **Barghoorn** for preparation of a rubber modified thermoplastic resin comprising an acrylate rubber in a process as taught in the claims of the instant invention. In addition, **Barghoorn** does not address the problem identified and solved by the present inventors. There is no teaching in **Barghoorn** regarding how one might improve grafting efficiency in the preparation of a rubber modified thermoplastic resin comprising an acrylate rubber. The inventors have shown in Examples of the invention that the process conditions and resulting compositions taught and claimed therein provide unexpectedly improved grafting efficiency, impact strength, weathering performance, and other benefits in comparison to those taught in the corresponding Comparative Examples of the instant invention.

The specific object of **Barghoorn** involves preparing diene-based graft rubbers by selectively hydrogenating ethylenically unsaturated double bonds in the elastomeric polymer (**Barghoorn**, column 2, lines 30-32). The majority of repeat units in **Barghoorn's** "graft rubber" must contain an ethylenically unsaturated double bond because **Barghoorn** requires a diene-based graft rubber. In contrast, the instant invention comprises a graft rubber derived from a (C<sub>1</sub>-C<sub>12</sub>)alkyl(meth)acrylate monomer. Ethylenically unsaturated double bonds in the graft rubber of the instant invention may be derived from a polyethylenically unsaturated comonomer added as a crosslinking and "graftlinking" agent as is clearly taught in paragraph 0015. Hydrogenation of any residual ethylenically unsaturated double bonds in graft rubbers of the instant invention would prevent said double bonds from serving the purpose of providing graftlinking sites for subsequent reaction with grafting monomers (kindly see paragraph 0015). Therefore, in this regard **Barghoorn** explicitly teaches away from the instant invention. No one skilled in the art can derive any teaching or suggestion from **Barghoorn** for improving the grafting efficiency and balance of properties in a rubber modified thermoplastic resin comprising an acrylate rubber as is taught and claimed in the instant invention. Therefore, it would not have been obvious to one of ordinary skill in the art to modify a process for producing graft rubber in **Barghoorn's** invention to produce the instant invention.

In view of these remarks, it is respectfully requested that the rejection of claims under 35 U.S.C. 103(a) as being unpatentable over **Barghoorn** be withdrawn.

**35 U.S.C. § 103(a) Rejections : Molnar/Gaggar**

The Examiner has rejected claims 1-64 under 35 U.S.C. 103(a) as being unpatentable over **Molnar** (U.S. 6,331,580) as taken individually or in view of **Gaggar** (U.S. 6,720,386). The Applicant courteously traverses these rejections with respect to the claims as amended.

Regarding **Molnar**, the Examiner states the following (quote):

“The difference between the present claims and **Molnar** is the requirement in the present claims that in the step (a) a mixture of monomers of styrene and acrylonitrile is grafted on the core elastomer. **Molnar** discloses an inner graft shell formed from styrene monomer and/or alkyl methacrylate and optionally of acrylonitrile monomer. It would have been obvious to one of ordinary skill in the art to select the mixture of monomers such as styrene and acrylonitrile for formulation an inner graft shell polymer in **Molnar’s** invention because the selection of monomers is depending on the desired characteristics of the resulting impact monomer.”

Considering **Molnar** individually, the Applicant respectfully submits that the stated object of **Molnar** is to provide a process for preparing core-shell MBS impact modifiers having a rubbery core weight fraction exceeding about 70% (**Molnar**, column 2, lines 51-53). More specifically, **Molnar** is directed to preparing a core-shell impact modifier comprising a core derived from a diolefin monomer and a vinyl aromatic monomer (**Molnar**, column 3, lines 25-30; and column 4, lines 17-23). In contrast, independent claims 1 and 33 of the instant invention recite a method and composition, respectively, directed to an acrylonitrile-styrene-acrylate (ASA) type resin. Said ASA resins are well-known in the art and comprise an acrylate as elastomeric phase or “rubbery core” as taught in paragraphs 0014-0016 of the instant specification. More particularly said ASA resin has an elastomeric phase or “rubbery core” comprising a

polymer having structural units derived from at least one (C<sub>1</sub>-C<sub>12</sub>)alkyl(meth)acrylate monomer as recited in independent claims 1 and 33. Furthermore, independent claims 27 and 59 specifically recite that the elastomeric phase comprises structural units derived from butyl acrylate. There is no teaching or suggestion in **Molnar** for any impact modifier with a core comprising a polymer having structural units derived from at least one (C<sub>1</sub>-C<sub>12</sub>)alkyl(meth)acrylate monomer as required by the claims of the instant invention.

**Molnar**, column 3, lines 14-24, teaches (quote): “The impact modifier of this invention is a core-shell polymer with (A) a rubbery core such as a copolymer containing a diolefin, (B) an inner graft stage comprised mainly of a hard polymer such as a polymer containing a vinyl aromatic monomer, (C) an intermediate sealer stage comprised mainly of an alkyl acrylate monomer and/or a polyunsaturated crosslinker, and (D) an outer shell comprised mainly of alkyl methacrylate monomers (such as methyl methacrylate) to provide compatibility of the core-shell polymer with the matrix polymer.” The Applicant respectfully submits that there is no teaching in **Molnar** regarding the ratios of specific monomers when more than one monomer is employed in any step, as required by claims of the instant invention. Furthermore, as the Examiner has noted, there is also no teaching in **Molnar** wherein in the step (a) a mixture of monomers of styrene and acrylonitrile is grafted on the core elastomer. More particularly, there is no teaching in **Molnar** of any process or composition derived from any process which comprises the steps of:

- (a) polymerizing a mixture of monomers in a first stage in the presence of the elastomeric phase, at least one of which monomers is selected from the group consisting of vinyl aromatic monomers and at least one of which monomers is selected from the group consisting of monoethylenically unsaturated nitrile monomers, followed by
- (b) polymerizing a mixture of monomers in at least one subsequent stage in the presence of the elastomeric phase from (a), wherein the monomers comprise at least one vinyl aromatic monomer, at least one monoethylenically unsaturated

nitrile monomer, and at least one monomer selected from the group consisting of (C<sub>1</sub>-C<sub>12</sub>)alkyl- and aryl-(meth)acrylate monomers,

as required by the claims of the instant invention.

Therefore, there is no guidance in **Molnar** for anyone skilled in the art for preparing any rubber modified thermoplastic resin comprising an acrylate rubber. More specifically, there is no guidance regarding the ratio of monomers when more than one monomer is employed in any step, as is required by claims of the instant invention.

The properties of rubber modified thermoplastic resins comprising an acrylate rubber as taught in the instant invention are quite different from those of such resins having a highly non-polar “vinyl aromatic + unsaturated diene-derived rubbery core” as taught in **Molnar**. There is no motivation for anyone skilled in the art to employ any teaching in **Molnar** for preparation of a rubber modified thermoplastic resin comprising an acrylate rubber in a process as taught in the claims of the instant invention. In addition, **Molnar** does not address the problem identified and solved by the present inventors. There is no teaching in **Molnar** regarding how one might improve grafting efficiency in the preparation of a rubber modified thermoplastic resin comprising an acrylate rubber. The inventors have shown in Examples of the invention that the process conditions and resulting compositions taught and claimed therein provide unexpectedly improved grafting efficiency, impact strength, weathering performance, and other benefits in comparison to those taught in the corresponding Comparative Examples of the instant invention. No one skilled in the art can derive any teaching or suggestion from **Molnar** for improving the grafting efficiency and balance of properties in a rubber modified thermoplastic resin comprising an acrylate rubber as is taught and claimed in the instant invention.

Regarding **Gaggar**, the Examiner states the following (quote):



“It would have been obvious to one of ordinary skill in the art to select the mixture of monomers such as styrene and acrylonitrile for forming an inner graft shell polymer as discloses by **Gaggar**, because the selection of monomers is depending on the compatibility between the rubber core, an inner shell and outer shell as disclosed by **Gaggar** at column 3, lines 25-27.”

The Applicant respectfully submits that the teachings of **Gaggar** do not cure the deficiencies of **Molnar**. More particularly, there is no teaching in **Gaggar** of any process or composition derived from any process which comprises the steps of:

(a) polymerizing a mixture of monomers in a first stage in the presence of the elastomeric phase, at least one of which monomers is selected from the group consisting of vinyl aromatic monomers and at least one of which monomers is selected from the group consisting of monoethylenically unsaturated nitrile monomers, followed by

(b) polymerizing a mixture of monomers in at least one subsequent stage in the presence of the elastomeric phase from (a), wherein the monomers comprise at least one vinyl aromatic monomer, at least one monoethylenically unsaturated nitrile monomer, and at least one monomer selected from the group consisting of (C<sub>1</sub>-C<sub>12</sub>)alkyl- and aryl-(meth)acrylate monomers,

as required by the claims of the instant invention.

Therefore, the combination of **Molnar** and **Gaggar** provides no guidance for anyone skilled in the art to prepare a rubber modified thermoplastic resin as encompassed by the instant claims. Furthermore, there is no motivation for one skilled in the art to combine the teachings of **Molnar** and **Gaggar** because **Molnar** is directed to preparation of multistage MBS core-shell polymers and **Gaggar** is directed to ASA compositions prepared by a different synthetic process. In summary, the combination of **Molnar** and **Gaggar** cannot render the present invention obvious.

In view of these remarks, it is respectfully requested that the rejection of claims under 35 U.S.C. 103(a) as being unpatentable over **Molnar** as taken individually or in view of **Gaggar** be withdrawn.

**Provisional Double Patenting Rejection**

The Examiner has provisionally rejected claims 1-7, 10-25, 27-31, 33-39, 42-45, 47-57, and 59-63 under 35 U.S.C. 101 as claiming the same invention as that of claims 1-54 of copending Application No. 10/434,914. The Applicant has received a Notice of Abandonment for Application No. 10/434,914 which was mailed January 12, 2005. Therefore, Application No. 10/434,914 is no longer pending and the provisional double patenting rejection must be withdrawn.

In view of the foregoing, the Applicant respectfully submits that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact the Applicant's undersigned representative at the telephone number below.

Respectfully submitted,



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